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ARTICLE XVI.

Some Observations on Nematoidea Imperfecta, and Descriptions of three Parasitic Infusoriæ. By Joseph Leidy, M. D.

From the obscure position in which entozoa are usually found, but little, comparatively, is known of the continuous history of any of them, and at present it is a quite prevalent opinion among helminthologists, from observations made upon several species of Distoma, that these beings pass through different stages of their existence—sometimes within an animal, at other times without the animal, or within several different animals. If this is the case, it becomes important to present all observed facts in connexion with the development of entozoa, and it is upon such considerations that I have presented the following description of some nematoid entozoa in an imperfect stage of development, or in a stage where no trace of generative apparatus is observable.

1. *Nematoideum cavitatis abdominis Passali cornuti*, (Pl. 11, figs. 42–45.)—This worm is found in the abdominal cavity of the *Passalus cornutus*, among the intestines and rete adiposa in about nine-tenths of the insects. It is met with frequently in great numbers; I have in my collection a vial containing over 5000, obtained from not more than 40 insects. Sometimes not over half a dozen are found, at others as many as 500 may be discovered in a single insect. The worm is usually curved ventrally, and exhibits but little motion until placed in water, when it becomes quite active, wriggling about for twenty-four hours or more.

It is about $1\frac{1}{2}$ lines long, but varies from 1 to 2 lines, and is about 1.150th of an inch wide. The colour is white, opaque; occasionally one or two will be found which are more or less brown or even black, but otherwise they do not differ either in construction or form.

The form is cylindrical, moderately narrowed toward the extremities; anteriorly truncated, posteriorly rounded, and terminated by a short, acute epidermal spine.

The structure is simple, exhibiting within the integument nothing but an alimentary canal and intervening granular matter.

The integument is thin, strong, elastic, transparent, and colourless. It presents a very faint appearance of being finely annulated.

The mouth is round, large, and surrounded by a slightly lobed margin or lip.

The pharynx is short, cylindrical, presents several longitudinal striæ, and opens into a long, wide, cylindrical œsophagus. The latter is but faintly outlined from the general granular structure of the body. It appears to have several longitudinal folds, and at its commencement has a yellowish coloured structure, (pl. 11, fig. 45,) apparently corneous, composed of oval or oblong lobes placed side by side around the commencement of the œsophagus. The ventricular intestine is white, opaque, cylindrical, a little less than the breadth of the cavity of the body, and in length extending to the anal aperture. Its inte-

rior is covered with an epithelial layer, the cells of which are granular, apparently containing oil granules, and measure 1.4200th of an inch in diameter. The posterior extremity of the ventriculus is rounded, and usually contains a large, oblong, translucent, highly refractive mass, of viscid oleo-albuminoid fluid, with several smaller globular masses of the same matter. When the worm is submitted to pressure, a portion of this matter exudes from the anus, with a number of transparent nucleolar and nuclear bodies, but the termination of the ventriculus, or its connexion with the anal aperture is indistinct.

The anus is a short oblique fissure, passing inwards and forwards, upon the ventral surface, a short distance in advance of the posterior extremity of the body. It is bounded by projecting lips, but its communication with the intestinal canal I could not detect. Posterior to the ventriculus, the body is occupied with a fluid, finely granular, and a coarsely granular oil-like matter. The remainder of the intervals of the body is filled with fluid and faintly granular matter.

Measurements.—Length, 1 to 2 lines; breadth at mouth, 1.600th in.; breadth at commencement of ventriculus, 1.280th in.; greatest breadth, about middle, 1.150th in.; breadth just in advance of anus, 1.250th in.; length of caudal spine, 1.2500th in.; from base of spine to anus, 1.300th in.; breadth of ventriculus at commencement, 1.320th in.; breadth of ventriculus at middle, 1.214th in.; breadth of ventriculus at termination, 1.280th in.

This entozoon I have seen in hundreds of the *Passalus*, at all seasons of the year, but in none did I ever discover it in any other stage of development than the one just described.

From the frequency and great numbers in which it is found, I thought it would afford an excellent opportunity to try the experiment, if upon introduction into another animal it would undergo any progress in its development. I accordingly obtained from the forests in our neighbourhood, and through my friend Baird, from the forests near Carlisle, over 200 individuals of *Passalus Cornutus*. A dozen of them I opened, and found them all infested with great numbers of the entozoon just described, and I therefore naturally concluded from this fact, in addition to past experience, that most, or probably all the other insects contained the same. Having obtained a dozen large frogs, (*Rana pipiens*,) after keeping them two weeks until they had voided all indigesta from the alimentary canal, I killed 8 of them, and examined them closely for entozoa. In seven, I found in the lungs *Distomum variegatum*; in all, *Distomum cygnoides* in the bladder; none in the intestines; and in five, an imperfect stage of a species of *Filaria* beneath the mucous coat of the stomach, in the mesentery, and in the abdominal muscles.

The remaining four frogs I then fed daily upon 10 individuals of *Passalus cornutus* each, for four days in succession, so that each frog in that time took 40 insects,—in all, 160. It is not to be presumed that the frogs voluntarily took this prescribed fare, for I was under the necessity of cutting off the legs, elytra, and mouth organs of the insects, and then forcing them into the throat of the frogs.

In twenty-four hours after taking the first involuntary dose of insect food, the frogs commenced voiding the indigestible pergamentaceous segments of the skeleton of the insects per anum, which they continued for a week after the unusual mode of administering their food was stopped.

At the end of two weeks from the commencement of feeding the frogs I killed one of them, and carefully examined the intestinal canal and other organs for the *Nematoideum*

Passali, but not a trace of it was to be found; the cloaca yet contained one or two fragments of the skeleton of the *Passalus*, with some epithelial scales, mucus, and a dark, mud-like, granular matter, but nothing else. The entozoon had been digested with the soft parts of the insect.

Two days after, I killed the remaining frogs, but in none did I discover the slightest trace of the entozoon in question. From the results thus obtained, we may conclude that this parasite finds no condition favourable to its existence, leaving out of the question entirely any farther development, in frogs, or probably in any reptile. But still the entozoon may pass part of its existence in other animals. In a state of nature, frogs would rarely have a chance of feasting upon *Passalus*,* because the latter is found in forests, beneath bark and in the wood of decaying dead trees, and here the woodpecker (*Picus*,) or other insectivorous birds would be most likely to meet with it, and with such birds a similar experiment, to the one performed with frogs, might be tried to see if the development of the entozoon would not advance within them.

2. *Nematoideum thoracis cavitatis Passali cornuti*, (pl. 11, fig. 46.)—This is an anguillula-like worm in an imperfect condition, found occasionally in the cavity of the thorax of *Passalus cornutus*. It resembles an embryonic *Ascaris*. Its movements are active and wriggling. It is whitish, translucent, cylindrical, and attenuated and acute posteriorly.

Structure.—Integument transparent, and colourless. Œsophagus long, narrow, cylindrical, and faintly outlined. Intestine broad, cylindrical, granular in appearance and faintly outlined. Anus an oblique fissure, not very distinct, just in advance of the tail, which latter is short and acute.

Length, 1.66th in.; breadth, 1.1000th in.

3. *Nematoideum intestinorum Armadillonis pillularis*, (pl. 11, fig. 47.)—This is also an anguillula-like entozoon, found coiled up and adhering by the mouth to the epithelial layer of the intestine of *Armadillo pillularis*. It is white, cylindrical, attenuated, and acute posteriorly. The intestinal canal presents the same appearance as in the last, but the œsophagus is broader.

Length, 1.53d in.; breadth, 1.360th in.

4. *Nematoideum integumentum Lumbriculi limosi*, (pl. 11, fig. 48.)—This is a small entozoon which I found, six in number, doubled up and motionless, contained in transparent oval cysts, imbedded in the integument of the 9th, 11th, and 15th, annuli of a *Lumbriculus limosus*. It resembled an embryo within an ovum. Its form is cylindrical, subacute posteriorly, truncated anteriorly, colourless and transparent. No interior organs were observable, except a small, round, transparent corpuscle posteriorly, and anteriorly, a probosciform body, partly projecting from the anterior extremity.

Length, 1.560th of an inch.

* The habitation of *Passalus*, however, offers no reason why a frog or toad should not occasionally feast upon them. At one time I thought the insect was confined to the haunts in which it is usually found, but it undoubtedly flies at night, as I have found it in places where some days before they did not exist, and my late friend Dr. Benj. Kern, once brought me half a pint of this insect, which he obtained on the Atlantic ocean, a few miles from shore, with numerous other insects, one morning after there had been a brisk wind in the night.

NYCTOTHERUS.*—*Proc. Acad. Nat. Sci.*, vol. 4, p. 233.

Body ovate, finely vibrillated, dilated posteriorly, compressed anteriorly; investing tunic granular and marked with longitudinal lines; antero-inferiorly and middle line of the body furnished with a semicircle of large vibrillæ, anterior to which is a large, granular, areola; posteriorly, with a short fissure passing inwards and downwards.

1. NYCTOTHERUS VELOX.—(Pl. 11, fig. 49, a. b. c. d.) *Proc. Acad. Nat. Sci.*, vol. 4, p. 233.

Body white, translucent, ovate; anteriorly obtusely rounded; posteriorly angular. Anterior areola faintly granular, trapezoidal, with bulging sides. Interiorly furnished with several minute vacuolæ, and usually one large and globular situated just at the end of the posterior fissure.

Length, from 1.254th to 1.180th in.; breadth, from 1.320th to 1.254th in.

This species is found in the commencement of the large intestine of *Julus marginatus*, occasionally in thousands. It moves with great ease and grace in the water, and after some time the external tunic bursts and allows large globules of the sarcodic mass to protrude, which often separate, as in fig. 49 d., and the animal is gradually destroyed.

2. NYCTOTHERUS OVALIS.—(Pl. 11, fig. 50.) *Proc. Acad. Nat. Sci.*, vol. 5, p. 100.

Translucent, oval; posteriorly, obtuse. Anterior areola large, granular. Posterior fissure passing downwards.

Length, 1.187th in.; breadth, 1.250th in.†

Found in the intestinum tenue of the *Blatta orientalis*, occasionally in large numbers.

BODO JULIDIS.—(Pl. 11, fig. 51.) *Proc. Acad. Nat. Sci.*, vol. 5, p. 100.

Body translucent, faintly greenish, faintly granular, with one or two large round vacuolæ, and numerous minute ones; form changing, usually globular, oval, or pyriform; caudæ twice the length of the body, very active, frequently becoming twisted into a ring at the extremity.

Diameter of body, 1.3000th of an inch.

This animalcule is found in the large intestine of *Julus marginatus*, with *Nyctotherus velox*, often in millions.

REFERENCES TO FIGURES. (PLATE 11.)

Figures all magnified.

Figs. 42—45.—*Nematoideum cavitatis abdominis Passali cornuti*.

43.—Posterior extremity in outline.

44.—Posterior extremity. The large internal transparent masses are observable, and portions of fluid and nuclear bodies expressed from the anus.

45.—Anterior extremity.

46.—*N. cavitatis thoracis P. cornuti*.

47.—*N. intestinorum Armadillonis pillularis*. A portion of membrane is observable attached to the mouth.

48.—*N. integumenti Lumbriculi limosi*, doubled up within its sac.

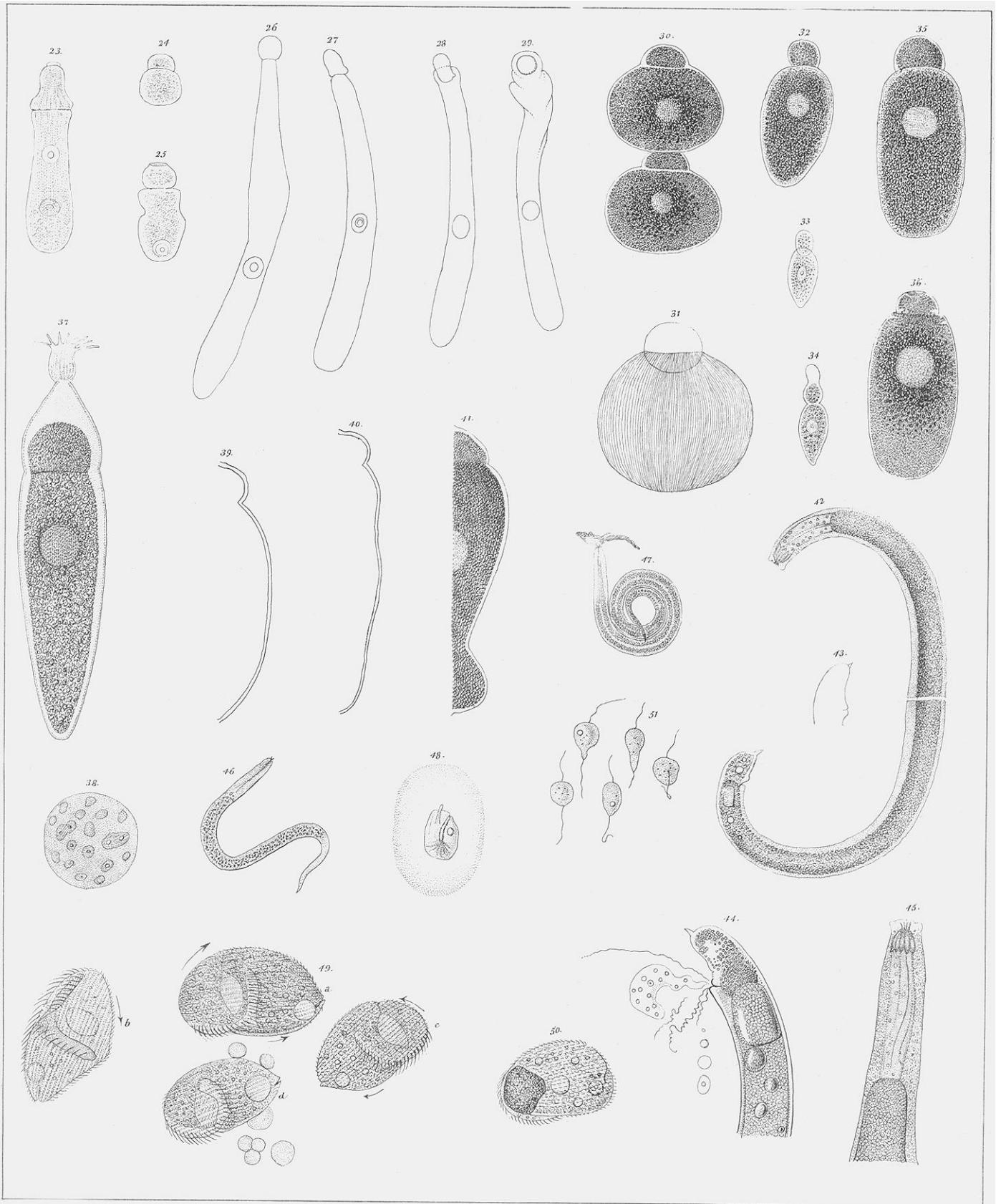
49.—a, b, c, d, *Nyctotherus velox*.

50.—*N. ovalis*.

51.—*Bodo Julidis*.

* Νυκτοθήρας.

† The measurements given in the *Proc. Acad. Nat. Sci.* are erroneous, being a mistake of the printer.



Joseph Leidy, del.

T. S. Dallas, lith. Phil.

Fig. 23-29 *Gregarina Polydesmi Virginianensis*
 30-31 " *Passali cornuti*
 32-34 " *Acheta abbreviata*
 35-38 " *Locusta Carolina*
 39-41 " *Blatta orientalis*
 42-43 *Nematodea imperfecta*
 49 a d *Nyctotherus velox*
 50 " *ovatus*
 51 *Bodo Sulcidis*